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CANOES OF OCEANIA

By

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VOLUME I

THE CANOES OF POLYNESIA, FIJI, AND MICRONESIA

By James Hornell

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Outrigger. On the port side six booms connect with the float in typical manner (fig. 177, *a*), with the addition of a strengthening withy brace attached on one side of each set of connectives. This withy runs obliquely upward and inward from its distal attachment near or to the lower end of one of the inner stanchion connectives to be lashed to the boom at a point well inside of the attachment of the upper end of the same stanchion. (See fig. 179, *c*.)

A stringer is lashed fore and aft over the booms and under it are lashed the outer ends of six short pseudo-booms which do not connect with the float.

The booms are lashed upon the edges of the washstrakes with the attachment further strengthened on each side by an oblique sennit brace lashed above around the boom outside of the hull, and below through holes in the side of the dugout underbody. As the offside washstrake is slightly higher than that on the outrigger side, the booms slant downward toward the float; this enables the stanchions to be made shorter than if the booms were horizontal.

Rig. Each of the two masts is stepped in a socket in a circular boss on the bottom of the underbody and of one piece with it.

Formerly each mast was lashed against the after side of one of the booms, but today it passes through a median hole in a stout thwart lashed to the gunwales. The fore mast is stepped well forward and immediately abaft the foremost boom, the second mast behind the fourth boom.

This sailing canoe is used only within the lagoon and is said to load three tons of copra.

TECHNICAL TERMS

Aioka: withy brace to attachment.
Ama: float, outrigger side of canoe.
Ekengaulu: large double canoe.
Iekelima: large outrigger (five-man canoe).
Kaukau: outrigger boom.
Katea: off or starboard side.
Kiato: stringer across booms (the usual Polynesian term for "boom").
La: sail.
Mua vaka: forward end of canoe.
Muli vaka: after end of canoe.
Oa: washstrake.
'Oe: paddle.
Puke: forward end cover.
Talamoko: diamond-shaped boss on end cover.
Tata: bailer.
Tau ama: outrigger stay.
Tila: mast.
Tila lalo: boom of sail.
Tila lunga: yard of sail.
Tukuku mua: fore stay.
Tukuku muli: after stay.
Tutuki: stanchion connective.
Vaka: canoe or hull.
Vakalua: double canoe.
Velo: after end cover.
Wawa: sheet.

For the foregoing particulars of the Pukapukan canoe I am indebted to the courtesy of Mr. Gordon Macgregor, ethnologist of the Templeton Crocker Expedition.

TONGAN ARCHIPELAGO

At the present time the only surviving sea craft of indigenous origin in Tonga are numerous small dugouts (*bobao* and *tuingutu*) used in inshore fishing and a few plank-built sea-going canoes (*tcfa'anga*) employed exclusively in the bonito fishery. All are provided with single outriggers having indirect attachment; the small dugouts are in general more roughly constructed than their Samoan equivalents, the *paopao* and the *soatau*. The *tafa'anga* is the counterpart, save in outrigger attachment, of the Samoan *va'a alo*. Larger vessels were formerly numerous but all are now non-existent. They comprise the following:

1. The ancient *vaka* type of voyaging outrigger canoe in use before intercourse with Fiji in the latter part of the eighteenth century caused its displacement by:
2. The modern *vaka* or *hamatafua*, a large and stoutly built sailing outrigger canoe, constructed on the lines of the Fijian *thamakau*.
3. The *tongiaki*, a double canoe of the same type as the Samoan *va'a tele*.
4. The *kalia*, a double canoe of Fijian origin and design which displaced the *tongiaki* during the last quarter of the eighteenth century.

Another extinct type is the *vaka-vaka-amci*, an antique float or raft of peculiar design.

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OUTRIGGER CANOES

Bobao

501 The *bobao* of today, a small paddling canoe, has a dugout hull, the bottom round, the sides tumble-home, and commonly so roughly hewn out as to be little more shapely and adapted to be a canoe than one of the village slit drums were it [101] to have the ends pointed. As observed during my visit to the islands in 1925, the hulls range in size from 10 to 15 feet in length, with an outside beam at the gunwale of 8 to 9 inches, increasing at the bilge to 12 to 16 inches; the depth ranges

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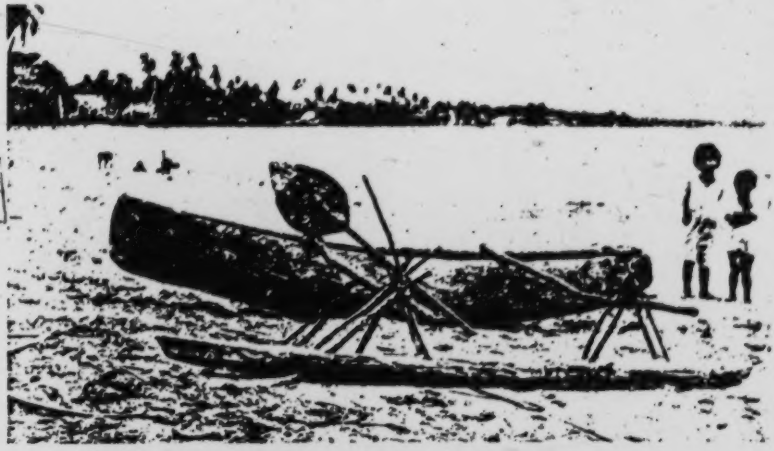

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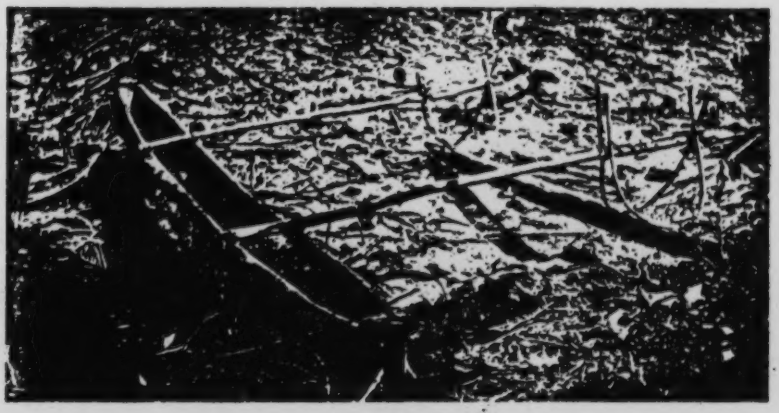

b

FIGURE 180.—Modern Tongan dugout outrigger canoes (*bobao*): *a*, from Haapai, connectives are paired sticks, the forward set reinforced by an unpaired one; *b*, from Vavao, two double U connectives to each boom (photographed in 1925).

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between 12 and 15 inches. (See fig. 180.) There are indications of a definite head and stern, one end being sharp or bluntly wedge-shaped, the other roughly pointed, characteristics also of Samoan and Tahitian hulls. The ends are solid for a distance of several inches. 501

The outrigger consists of two straight booms, projecting outboard on the port side 5 to 7 feet, and commonly connected with the float (*hama*) by U-shaped withies (*tukituki*). The float is cylindrical; in the smallest canoes it is pointed at both ends, in the larger only at the fore end, the other being truncate. As in Samoa the fore, free part extends well forward, though not quite to a level with the head: the after end, behind its attachment to the boom, is short.

The U type of connective, characteristic particularly of the *bobao*, consists of a pair of tough flexible withies to each boom, each withy bent into a deep bow or U shape, the limbs spread from 8 to 10 inches apart in the *bobao* and about 12 inches or more in the *tuingutu* (fig. 181).

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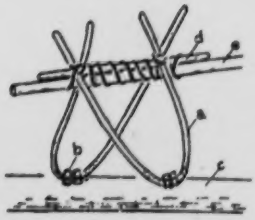

FIGURE 181.—Double U-shaped outrigger attachment, Tonga: each withy (*a*) lashed at its base to two pegs (*b*) driven into float (*c*); horizontal cross bar (*d*) tied under crossed arms of withies; end of boom (*e*) then slipped under cross bar and the two lashed together by several turns of cord or sennit (Vavao, 1925).

The bent base of each withy is secured to the upper side of the float by lashing passed around two short, stout pegs driven abreast into the float. One of the pair of withies is attached to the float some inches forward of the axis of its boom, the other at an equal distance on the after side. The pegs to which the withies are lashed project about 2 inches; the heads are slightly swollen.

The limbs of each U are turned obliquely upward, inclining toward those of the opposite pair, with the result that the upper ends of the two withies cross one another. To keep them in position, a short rod of *toa* (*Casuarina*) is inserted as a brace immediately beneath their decussation and lashed thereto in this position. To make connection with a boom, the outer end of this is slipped under the bracing rod and made fast with sennit lashing. [283]

This accessory device is of service when the outrigger frame has to be partially dismantled: all that is necessary is to unlash the braces from the booms; the float with its connectives held together by the braces may then be removed from attachment to the booms without disturbance of the various parts. Reassemblage can also be effected in a fraction of the time that otherwise would be necessary. In no other Pacific area does this device exist. 501 [171]

Exceptional forms of float attachment are occasionally found. In Lifuka a very small and roughly made *bobao* was seen in which the connection was by means of paired straight stanchions of the type characteristic of the *tuingutu* (fig. 180, *a*). Another in the same island had a mixed connection, the after boom having the paired U connection, the forward one the paired stanchion form.

A third attachment is found on the great shallow backwater lagoon in Tongatabu, where there are in use a few rude dugouts of such low freeboard that direct

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[501] attachment is possible, the outer ends of the two light bamboo booms being lashed directly to the float; such craft are readily improvised when the occasion requires.

Early in the nineteenth century the *bobao* was more carefully constructed, according to the description and figures furnished by Paris (1841, pt. 1, p. 123, pl, 122, figs. 12-14). Unlike the present-day *bobao* the dugout underbody had fairly long end covers roughly sewn on, together with a low washstrake and transverse breakwaters protecting the open waist. The ends were similar and bluntly pointed. Across the washstrakes were lashed the inner ends of three outrigger booms; the outer or end booms were attached to the float by means of two pairs of convergent overcrossed stanchions, and the median one was supported by a single vertical stanchion. No cord brace was employed, if the figure may be trusted. As [565] drawn, the float, like the hull, was pointed at each end (fig. 182). Paris remarks

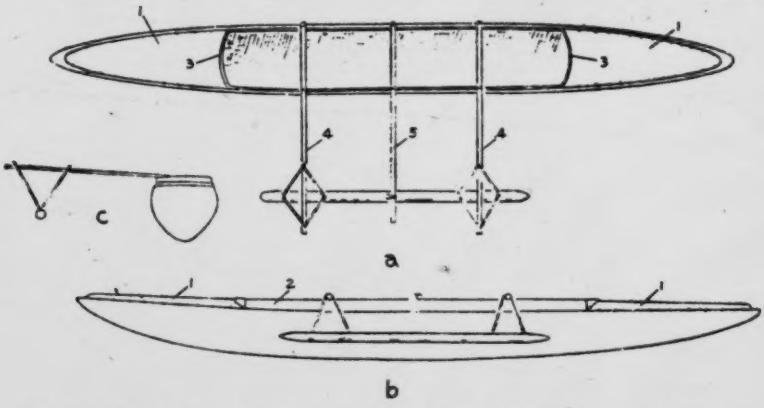

FIGURE 182.—Tongan *bobao* of ancient type: *a*, plan; *b*, side view; *c*, cross section, showing boom tilted upward slightly in its outboard section as in Samoan canoes; 1, end covers; 2, washstrake; 3, curved breakwaters; 4, outer boom attached to float by two pairs of converging overcrossed stanchions; 5, median boom, connected by one upright stanchion (after D'Urville, 1846).

that the rounded hulls "were neither polished nor rubbed with oil and appeared to be used only by the lower classes of the population". Its length seldom exceeded 5 meters. This old type of *bobao* is intermediate in design between the existing degenerate type and the larger sailing one, the *tuingutu*.

TUINGUTU

The *tuingutu* has also a dugout hull. Being a larger and more valuable craft and adaptable for sailing as well as paddling, greater attention is paid to the finish. (See fig. 183.)

[171] The two ends are more carefully shaped and approximate more closely to the equivalent Samoan form, the *soatau*, the sharp fore end often with a distinct though slight concavity in the cutwater as seen in side view, the stern running to a point, and in a few canoes ending in a downturned subtriangular knob, useful when tying the canoe up, and of exactly the same shape as seen in the better-finished of Samoan canoes. There are the same rounded bottom and [283] tumble-home sides as in the *bobao*, but here a narrow washstrake, 5 to 6 inches wide, is sewn on with sennit, each pair of holes separately sewn and all the holes plugged with wooden pins. A batten of split bamboo is inserted on the outside along the joint under the stitches.

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Each end for a length of about 12 inches is solid. The intervening space between each of these solid regions and the near-by boom is usually decked over with transverse planking, the innermost board with a mast hole in the center, an arrangement which permits the canoe to be sailed either end forward; this is associated with a float sharp at each end. The rig in use is, however, derived from a European type; no canoe is now rigged in the manner current at the time of the discovery of the islands. In one canoe a wide triangular platform, nearly equilateral, covers each end of the hull, the lateral angles projecting outboard a little distance; this platform is to give footing to the fisherman when spearing fish.

FIGURE 183.—Tongan inshore canoe (*tuingutu*) of Vavao with three booms, each with two pairs of U connectives, typical of the Vavao attachment (photographed in 1925).

In some small canoes the central space or well between the booms is surrounded by a box-like structure consisting of two long side boards, forming rude washstrakes connected at the fore and after ends by a transverse board or breakwater. In the larger ones with three booms, the washstrakes are more typical and extend nearly the whole length of the hull; they are generally closed in at each end by a low transverse breakwater. (See fig. 184.)

Two or three thwarts rest loose upon the edges of the dugout hull at its junction with the washstrake.

Most of the smaller canoes, 16 to 18 feet long, are provided with two straight outrigger booms, fitted horizontally, and the larger, ranging from about 20 to 30 feet in length, with three. The booms may either be slender *toa* (*Casuarina*) poles or somewhat stouter bamboos.

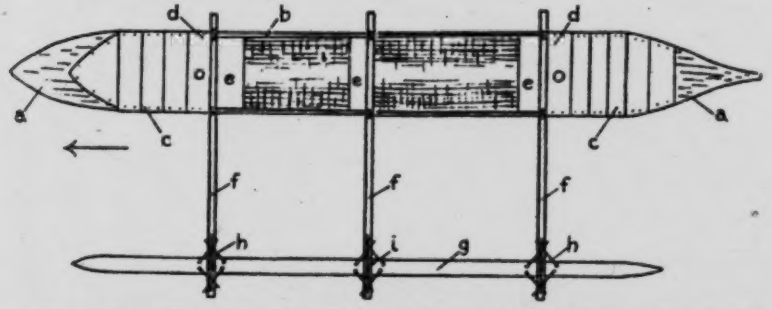

FIGURE 184.—Modern Tongan *tuingutu*: *a*, solid ends; *b*, washstrakes; *c*, cross planking covering space between each outer boom and adjacent solid end of underbody and nailed upon edges of washstrakes; *d*, mast thwart at each end enabling outrigger to be kept to windward on any course; *e*, loose paddling thwarts resting on edges of underbody; *f*, booms; *g*, float; *h*, stanchion connectives; *i*, horizontal rod holding stanchions in position when outrigger is dismantled, when in use lashed upon upper side of boom.

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501 [283] They rest upon the edges of the washstrakes, to which they are lashed by sennit or by cord passing through, usually, one hole a little below the gunwale.

The float varies considerably in shape and relative length; in the smaller or paddling canoes it is cylindrical, the fore end conical, the after one truncate; in the larger, which are frequently used under sail, it is roughly canoe-shaped, flat above, rounded below, and with the ends sliced away on each side and from below to a point.

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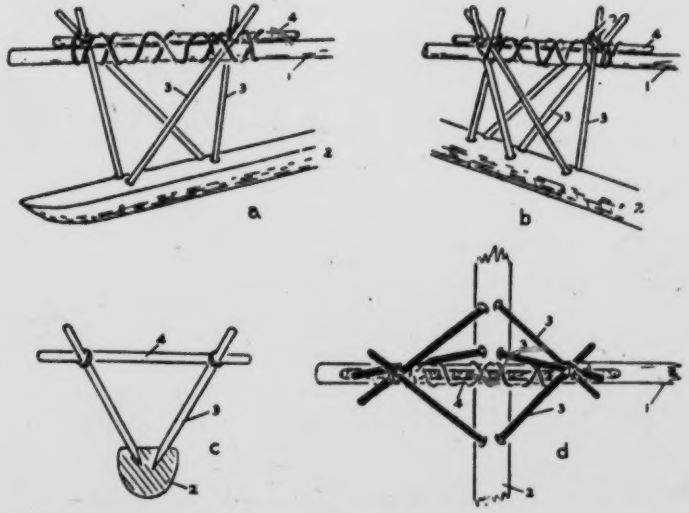

FIGURE 185.—Tongan stanchion attachment: *a*, two-paired, and *b*, three-paired form of stanchion attachment; *c*, attachment separated, float seen in cross section, only one pair of stanchions shown; *d*, top view of *b*; 1, boom; 2, float; 3, stanchions; 4, brace rod.

501 [17] The float connection is either of the U type or by means of paired stanchions. The U type is the same as described for the *bobao*; the stanchion type is comparable with the Samoan and Fijian types. Two varieties of the stanchion type exist, the double and treble. The double, except in one detail, is similar to the Fijian, two pairs of obliquely converging stanchions crossing above the boom. The detail in which it differs is the use of an intermediate and horizontal brace stick, about 2 feet long (fig. 185), to which the heads of the stanchions are directly lashed prior to the lashing of the brace in turn to the end of the outrigger boom; this is the same device as that employed in conjunction with the attachment of the U connectives in the *bobao*. In the treble variety an additional pair of stanchions is present; these two extra stanchions, which are inserted close together in the float immediately under one side of the boom, diverge upward from this point in the plane of the long axis of the boom, to which they are respectively lashed at the same points as are the members of the two other pairs (fig. 185).

The largest *tuingutu* (fig. 183) was 30.5 feet long, the beam outside at the gunwale 13 inches, at the bilge 20 inches; depth of dugout hull 15.5 inches; width of washstrake 5.5 inches, a total depth of 21 inches; length of float 16 feet 9 inches; distance of float from gunwale 6 feet; booms three, attached 14.4 inches above the float; arms of U connectives 12 inches apart where lashed to the booms; booms 4

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feet 6 inches apart; fore boom 69 inches aft of prow; after boom 75 inches forward of stern. The fore end of the float projected 31 inches in front of the first boom, the after end 18 inches behind the third boom.

Tafa'anga

Among the most elegant of Pacific outriggers, a few Tongan *tafa'anga* are known to have survived on the windward side (*liku*) of Tongatabu into the present century; in 1925 I saw the outrigger of one that was still in use at a village near the Haamonga trilithon, so the type is not yet extinct. A fine model of one now in the Cambridge Anthropological Museum is of great historical as well as ethnological value, for Thomson, who presented it, states in letters that it was made in 1891 by King George Tubou I when he was over 90, partly with his own hands and partly under his direct supervision. Thompson adds that the king was a great canoeman in his youth, and records (1894, p. 343) that "none could handle a *tafa'anga* laden with fish in a seaway as he". Thompson states that all the old men who saw it declared it tc be accurate in every detail, yet an error has crept in, the arms of the U connectives crossing under the boom, an arrangement seen in none of the numerous canoes examined in 1925; in these, as also in Thomson's illustration (1894, p. 343), the arms invariably cross above the boom. The model has every appearance of having had its outrigger parts detached and subsequently reassembled after leaving Tonga; this would account for the discrepancy.

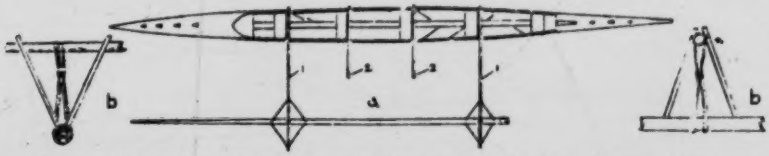

Figure 186.—Tongan *tafa'anga*: *a*, plan showing two functional booms (1) and two accessory ones (2), the bonito-rod rest and the median row of pegs shown somewhat conventionalized; *b*, details of outrigger attachment, stanchion lashings to boom omitted in original plate (after Paris).

As illustrated by this model, the *tafa'anga* is identical in all respects save the float attachment with the Samoan bonito canoe (*va'a alo*). There is the same long narrow hull, the same long decking at each end, ornamented with a median row of knobs to which snow-white cowry shells are tied as a decoration; the arrangement and number of the booms (two) are identical, as is also the fitting for the great bonito rod behind the aftermost thwart. There is also present a short median accessory boom, a pseudo-boom, not connected with the float. But in the float attachment the paired U type characteristic of the small dugout outriggers of Vavao and Haapai takes the place of the Samoan inserted stanchion type.

It appears, however, that the Samoan type of attachment was formerly employed, for in the figures of a "tafahanga de Tongatabou" given by Paris (1841, pl. 122) the details of both the hull and the outrigger are precisely those of the Samoan *va'a alo*; the attachment is identical, consisting as it does of two pairs of obliquely running inserted stanchions and a vertical cord brace passed around the float (fig. 186). In figures of the same type of Tongan vessel given by Cook (1777, pls. 16, 43), attachment is again shown quite distinctly as consisting of

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501 [17] inserted stanchions, but the cord brace is omitted. Such evidence indicates that the *tafa'anga* was originally identical with the Samoan *va'a alo* and that the attachment was of the inserted stanchion type; it suggests that the attachment has been modified into the existing U type at a comparatively recent date.

175 501 It was probably a *tafa'anga* which Tasman, in 1643, saw put off from the land with three men in it. He describes it (1898, p. 26) as a small prow "very narrow, covered in to a good distance in front and abaft". Another canoe (1898, p. 27), seen later, had "the outriggers trimmed with shells and conchs", from which embellishments Tasman judged it to belong to the king or chief of the country. In the same drawing in which a double canoe under sail is the central figure, Tasman gives the figure of a paddling outrigger which is unmistakably a *tafa'anga*; all the features, down to the backwardly inclined bonito rod in position behind the steersman, identify it with certainty. Two booms, the correct number, project from the port side; the attachment of each is by two pairs of stanchions and not by U withies (fig. 190). The only other marked divergences from the existing design, allowing for the crudity of the drawing, are the absence of an accessory pseudo-boom and of the row of knobs down the center of the end deckings. It is worthy of note that Cook also does not show a pseudo-boom in his plan of the same kind of craft figured in his scaled drawings (1777, Atlas, pl. 16), and as some of the canoes met with during his visits were without egg-cowry decoration Tasman's figure may be correct in this omission. The remarkable accuracy of Tasman's details, so far as they are to be seen, goes far to inspire confidence in the artist's delineation of the larger Tongan vessel, the *tongiaki* (double canoe).

Cook had great praise for the Tongan canoe builders. Of his first visit in 1773 he writes (1777, vol. 1, p. 125):

> Nothing can be a more demonstrative evidence of their ingenuity than the construction and make of their canoes, which, in point of neatness and workmanship, exceed everything of this kind we saw in this sea. They are built of several pieces sewed together with bandage, in so neat a manner, that on the outside it is difficult to see the joints. All the fastenings are on the inside, and pass through kants or ridges, which are wrought on the edges and ends of the several boards which compose the vessel, for that purpose. They are of two kinds, viz., double and single . . . The single ones [*tafa'anga*] are from 20 to 30 feet long and about 20 or 22 inches broad in the middle; the stern terminates in a point and the head something like the point of a wedge. At each end is a kind of deck, for about one third of the whole length, and open in the middle. In some the middle of the deck is decorated with a row of white shells, stuck on little pegs wrought out of the same piece which composes it. These single canoes have all outriggers, and are sometimes navigated with sails, but more generally with paddles, the blades of which are short, and broadest in the middle.

Cook's figures show the float attachment to be of the stanchion type; no cord brace is present, neither is there a pseudo-boom.

Forster suggests that the islanders took the bonito and albacore as their model in designing the hulls of their canoes, and that the row of pegs along the center of the deckings represents the finlets along the tail of these fishes (1777, vol. 1, p. 461).

A larger *tafa'anga*, the equivalent of the Samoan dolphin canoe, also existed, but the sole record of it is the figure in an aquatint by Webber, Cook's artist on his third voyage. The outrigger canoe in the foreground (fig. 193) has a hull larger but otherwise similar to that of a *tafa'anga* and with a bonito rest conspicious on the fore part of the after decking. The larger size of the canoe has entailed several notable additions to the *tafa'anga* design; the number of booms is increased to four, a balance spar is added, and mast and sail are carried. The

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booms are attached to the float in the normal way by paired stanchions but there are indications in addition of the use of bracing cords, as lines are shown passing around the float at the places where the stanchions are inserted. Over the outboard region of the four booms is lashed a rude fore and aft staging of planks. From the starboard side a balance spar giving purchase to a shroud projects far outboard, its inner end lashed upon or to the side of the second boom.

Unlike the ordinary *tafa'anga*, this large vessel, which has a crew of four, is fitted for sailing. A mast, short and vertical, is stepped apparently upon or just forward of the first boom. The precise form of the sail can not be determined as it is partially furled by being loosely tied up to the mast by a rope passed around it, midway up; from the masthead run a fore stay to the head of the canoe, a side stay or shroud to the outer end of the balance spar, and another, on the opposite side, to the outer end of the second boom, also a back stay to the stern.

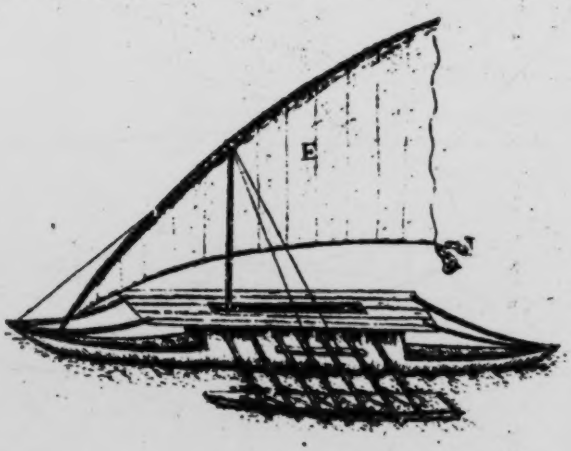

FIGURE 187.—Multiboom canoe seen at Namuka, Tonga, in 1643 (from Tasman, 1898).

A link between the *tafa'anga* as it is known today and the four-boom design drawn by Webber is that figured by Paris (1841, fig. 122) which has two accessory pseudo-booms, equally spaced between the two effective booms. Four paddling thwarts are present in addition to the steersman's seat. (See fig. 186.)

The available evidence points to the early type of *tafa'anga* as a multiboom canoe which by reduction of the median booms both in number and length has evolved into the present design of two effective booms and a median one of a vestigial character.

ANCIENT VOYAGING CANOE

The voyaging outrigger canoes had two forms, an earlier and a later. No description has survived of the earlier type, which was displaced within historic times by a Fijian model. Tasman (1898, fig. 4), however, gives an illustration which depicts a vessel of kindred type to the Fijian *thamakau* but simpler in construction and differing in many important details (fig. 187).

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501 The underbody, the hull proper, is without sheer, and is pointed and decked over at each end; in the median section, extending for considerably more than one third the length of the hull, a deep washstrake is fitted on each side, supporting seven athwart beams which project far out on the port side and to a short distance on the starboard side. To their outer ends on the port side a float is attached by pairs of convergent stanchions in the Samoan and Fijian fashion; the float is flat above, round-pointed in front and truncate behind. A wide planked platform is lashed upon the booms where they cross the hull. At both ends it projects beyond its supports, and on each side it also projects outboard some little distance. Two spars at each end connect the pointed end of the hull with each of the adjacent corners of the platform. [171] (In the Fijian *thamakau* there is one only of these connecting spars at each end, both upon the lee side.) No deck fittings are shown. Down the center of the platform a wide continuous hatchway opens into the body of the vessel, exactly similar in position to the long hatch over each hull in the contemporaneous double canoe (*tongiaki*).

The mast is short and vertical, fitted behind the first boom and well forward of the mid-length of the hull; probably it was stepped upon one of the booms. Two shrouds pass on the weather side from below the masthead to a stringer lashed athwart the three median booms a few feet outboard; a forestay runs from the same point to the pointed head. No indication is given of a sheet, and halyards were unnecessary. The sail, triangular in shape, is laced or tied along the fore side to a stout curved yard, the foot being similarly fastened to a boom which is shown in the drawing as somewhat lighter than the yard. Instead of being hoisted by means of a halyard, the yard at about midlength rests in a deep fork at the masthead. [175] This unusual arrangement is confirmed by Cook when describing the rig of the *tongiaki*: it [177] is an arrangement clumsy and dangerous in the extreme and it reflects ill on the ingenuity of the Tongan sailors that they did not find any better way of hoisting their sail until nearly the end of the eighteenth century, when they adopted without modification the highly efficient method used by the Fijians. In Tasman's figure the heel of the yard is stepped on the fore decking between the two spars passing from the prow to the fore corners of the platform.

This type of canoe appears to have borne the same relation to its successor, the *vaka* or *hamatafua*, as the old Tongan double canoe did to the *kalia*; both this canoe and the *tongiaki* represent primitive and unhandy craft that gave place to improved types borrowed without alteration or improvement from the Fijians.

Vaka or Hamatafua

175 A voyaging canoe (*vaka* or *hamatafua*) built after the still-existing Fijian
177 design of the *thamakau* displaced an older and indigenous type soon after the
501 time when intercourse between Tonga and Fiji began to be active in the second half of the eighteenth century. Little information survives regarding its details except a colored figure (D'Urville, Atlas, 1833, pl. 78) and several line drawings (Paris, 1841, pls. 119, 121, fig. 10). The figures by Paris represent what is unmistakabably a copy of a finer type of Fijian *thamakau* than any now existing.

The hull remained much the same as in the older type, but the median platform, instead of projecting equally on each side, extended farther over the outrigger framing on the weather side and the long hatchway became two short ones in order to permit the mast to be stepped between them, immediately over the weather gunwale, and exactly amidships (fig. 188). On the weather side of this, partly over the outrigger frame, an elaborate form of thatched hut was erected, with an open stage and railing above its roof to accommodate the chief and his principal officers; various parts of the framework were adorned with egg-cowry shells.

Of the outrigger booms, three only were connected with the float, the attachment being by paired convergent stanchions; the greater number of the booms failed to extend outboard as far as the float, and became accessory booms functioning solely as supports for the deck platform. Spar struts connecting the ends of the hull with the corners of the platform were present only on the lee side as in the *thamakau*.

From the *thamakau* the design differed in only one particular: the two ends were similar and each was brought to a sharp point instead of one end being deep and sharp, to form a vertical cutwater, the other running fine to a small, ovately truncate extremity a few inches in diameter. Whether Paris is correct in showing the ends similar and sharp-pointed can not now be decided. He depicts the Tongan double canoes of the *kalia* design as having similarly sharp-pointed hulls, which is correct neither for the Fijian *thamakau* and *vdrua* nor for models of Tongan double canoes found in museums, which agree in this and other details with the

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Fijian type. It is, nevertheless, not unreasonable to infer that during the transitional period when the change over in type was taking place, Tongans engaged in building large canoes in the Lau Islands of the Fiji Archipelago may have modified this part of the Fijian design to harmonize with the form of the canoe ends which characterized their older and indigenous model (compare Hodges' figures in Cook, 1777). The rig is typically Fijian.

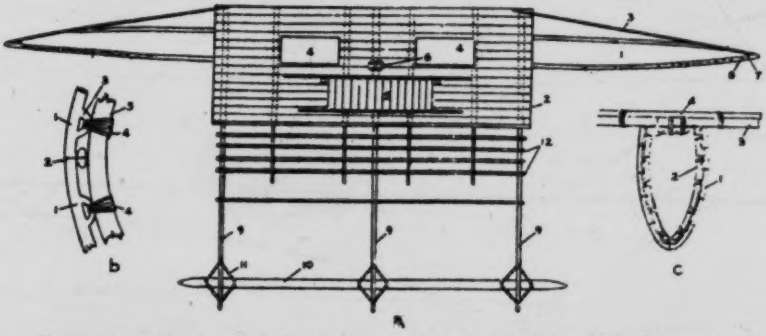

FIGURE 188.—Tongan *vaka* or *hamatafua* *a*, plan: 1, end cover; 2, deck platform (*rara*); 3, strut between corner of platform and head of canoe; 4, hatchways; 5, deck hut; 6, mast shoe; 7, hole serving as step for heel of yard; 8, vertical hole through which tack of yard is made fast; 9, three main booms; 10, float; 11, paired stanchion connectives; 12, stringers. *b*, details of attachment of portion of rib to hull: 1, two hull planks joined at seam (2) by projecting flanges lashed together through perforating holes; 3, comb cleat, wrongly shown as vertical instead of horizontal, through which lashings (4) pass to secure it to inserted rib (5). *c*, cross section of hull showing ribs and their position within hull: 1, planks of hull; 2, inserted rib; 3, outrigger boom; 4, deck planking. (Ater Paris, 1841.)

Some memory of this type of outrigger canoe is still retained in Tongatabu. The Rev. John Havea, a Tongan pastor well-known for his wide knowledge of native customs, informed me in 1925 that the proper term for this vessel in Tongatabu is *hamatafua*. It was, he said, a single outrigger of large size, rigged with one mast and a large triangular sail, but propelled by sculls in calms and contrary winds. He added that the hull might either be a very large dugout or be built up of planks sewn together in the manner of the *tafa'anga* and *kalia*. It could carry a considerable number of people.

The only reference in literature to this vessel under its rightful name is one by West (1865, p. 271), who relates how a number of the inhabitants of Atata, in order to escape from a raiding party from Namuka, "hastily manned a *hamatefua*, or single-sailing canoe, which happened to be moored on the lee side of the island . . . Wind and sea carried them straight upon Ata, the Pylstart's Island of the charts, where the little company grew into a Tonguese colony".

The *hamatafua* appears to have lingered on till comparatively recent times, for Mr. L. B. Levin of Nukualofa stated to me that he saw what he believes was the last one in 1883 during a visit to Lafonga in the Haapai Islands.

Although this form of *vaka* was copied undoubtedly from the Fijian, it has so many points in common with the older Tongan design that it seems probable that the Fijian was evolved from one akin or similar to this old Tongan one. The presence of a number of accessory booms not connected with the float suggests derivation from a multiboom ancestor such as is seen in Tasman's Tongan figure. The changes in the form of the deck platform and its fittings are also such as would be expected as skill in canoe building advanced, and I am therefore of

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501 177 opinion that this was actually the course of evolution. But this evolution took place in Fiji, and not in Tonga.

It is unquestionable that the Fijians were notably the superiors of the Tongans [181] and Samoans in the art of canoe designing, although the Tongans could claim the credit of being the more skilful carpenters and the more daring and experienced navigators.

U Attachment

Of the three groups of islands in the Tongan Archipelago, in Vavao the U type [184] prevails to the virtual exclusion of the stanchion type, probably because there are no longer any large canoes in use there; in Haapai, it is predominant, whereas in Tongatabu it is found only in the fishing villages on the south and east coasts; on the more populous north coast of Tongatabu the stanchion type alone is in use.

This distribution might lead to the inference that the U type is of older employ- 501 171 ment in these islands than the stanchion type. Against this conclusion have to be placed two facts. The first is that both in the canoe types surviving in Tonga and in those that have disappeared there is the closest possible affinity with those of Samoa except in regard to the U attachment, which the Samoans have certainly never employed since European contact; neither has there ever been any suggestion that they had it previously. The second fact is that both Tasman and Cook, the one in 1643 and the other in 1773, figured the stanchion attachment as the one in use at the time of their visits. So also did D'Urville and Paris. It seems probable that the Tongans, originally an offshoot from the same stock as the Samoans, had primitively the Samoan stanchion attachment, subsequently modifying this for use only in their smaller canoes into the U type, which may be a localized modification of a pair of stanchions inserted in the float in a Y or V manner, or may be a comparatively recent introduction from some non-Polynesian locality. It is a form of attachment unknown in Polynesia outside of Tonga.

There is evidence that Tongan voyages, usually involuntary, extended to New [48] Caledonia, and it is known, for example, that Wallis Islanders were drifted to the Loyalties about the beginning of the nineteenth century (Lambert, 1900, pp. 501 54-55). Many of these castaways remained there and formed permanent settle- 177 ments in Uvea, Lifu, and other islands, but we may be sure that some returned 178 home, and it may be that in this we have the explanation of the occurrence of the U connective in Tonga.

In New Caledonia the shank of the Y connective in use there is sometimes so deeply inserted into the float that it becomes reduced to an approximation to the V type. The Tongan form may have arisen from the substitution of this modified Y form for two stanchion connectives—the ordinary Tongan attachment. The V part of the device, increasing in relative importance at the expense of the shank, might assume eventually its present form, a broad and deep U-shaped section lashed at the base to two diminutive pegs, the homologues of the original stanchions or a duplication of the shank of the Y. The introduction of the U connective may have taken place at a comparatively recent date; there is reason to believe that the southern New Caledonians adopted the *ndrua* form of double canoe from the Tongans, who did not begin to change over to this design until the latter part of the eighteenth century, as is learned from the accounts of Cook and others; the sketches given by Tasman, Cook, and Paris of Tongan canoes, the *tafa'anga* in particular, all show the connectives as paired stanchions and none make any allusion to the U form.

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Corroboration of the course of evolution above outlined is afforded by the form of attachment seen in a canoe of Mare, in the Loyalty Islands, where, although a Y connective is employed, a very short peg is inserted into the float at each side of the shank of the Y, to which both pegs are lashed. This would appear to represent an intermediate phase between the New Caledonian Y and the Tongan U attachment.

On the other hand, it is possible that the U attachment was introduced into Tonga by a section of the Indonesoids who were the last-comers into Polynesia. In the extreme eastern islands of Indonesia the U attachment, but in the single U form, is common and occurs in the same Moluccan localities as the *orembai* and its near relatives. A double U attachment, but undercrossed, occurs along the whole coast of New Britain and in the Witu Islands; in San Cristoval at the south end of the Solomon Islands it recurs and this time in the overcrossed condition. However, in all these instances the U withies are attached to the float by cord lashings passed around the float itself. I incline to the conclusion that the U attachment seen in Tonga, where the withies are attached to accessory pegs and thereby have indirect attachment, has had a different origin as suggested above. Further, what evidence we have indicates that the U attachment is too recent in Tonga to have been introduced from a comparatively ancient Indonesian source.

The story of Oceania contains many instances of the substitution of new designs for old in canoe details; the islanders are receptive and quick to recognize and adopt any detail in the design of canoes of other islands which by accident or otherwise come under their notice. Instances in point within recent times are the adoption by the Marquesans of a plank connective in place of paired stanchions and the Samoan utilization of the whaleboat design in the construction of their great modern paddling canoe, the *taumualua*, displaced in the present century by the long *fautasi*, rowed by many oars.

DOUBLE CANOES

Tongiaki

The *tongiaki* was the form of double canoe in use in Tonga till toward the end of the eighteenth century, when the Tongans began to substitute the Fijian *ndrua* (Tongan *kalia*) as a more serviceable and weatherly craft. Fortunately several excellent illustrations of the *tongiaki* and a fairly full description by Cook himself exist. It happened that the change-over of types was beginning when Cook visited the islands in 1773 and 1774; he saw both and has several references to each.

Schouten (1619, p. 39) came across a *tongiaki* off Tafahi (called by him "Cocos Island") in 1616; it had been drifted out of its course and the crew were in a starving condition:

> [The vessel consisted of] two long and handsome canoes connected together but at some distance apart. Along the midships region of each, two broad planks of red wood were secured upon the edges [one on each side]; across these [washstrakes] small beams were laid [from hull to hull] and over them a platform of planks, the whole carefully fitted and made watertight with all the parts strongly lashed together. Toward the fore part of the starboard hull was stepped a short mast, forked at the top, on which was slung the sail; this was of matting and made after the fashion of those carried by Spanish boats [i.e., the lateen]. . . . Their cordage was strong and well laid. [See fig. 189.]

Two days later they came across two other vessels of the same kind and the chronicler records:

> The crew of one of them had aboard their vessel a canoe which they could launch whenever the occasion required. [Compare the Samoan custom of shipping two *va'a-alo* aboard

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175 501 [71] a *va'a tele*, their equivalent of the *tongiaki*, when going on a fishing excursion toward Uvea.] . . . The rig of these vessels is so excellent and they go so well under sail that there are few ships in Holland that could overhaul them. They steer them by means of two oars at the stern, one for each canoe.

175 501 285 531 Toward the upper end of the sail a figure representing a cock was outlined. This was evidently a common Tongan custom, for Forster (1777, vol. 1, p. 462), after remarking that some of these double canoes are large enough to carry 150 men, adds, "Their sails are latine, made of strong mats in which the rude figure of a tortoise or a cock, etc., is sometimes represented".

[291] [372]

FIGURE 189.—Tongan *tongiaki* seen off Tafahi in 1616 (from Schouten, 1619).

175 501 Twenty-seven years later, when Tasman discovered the Tongan islands (1643), this fine double canoe so impressed him that he devoted a whole page of his journal to the illustration of one under full sail (1898, fig. 2); another drawing shows two of the same kind of craft at anchor. (See fig. 190.)

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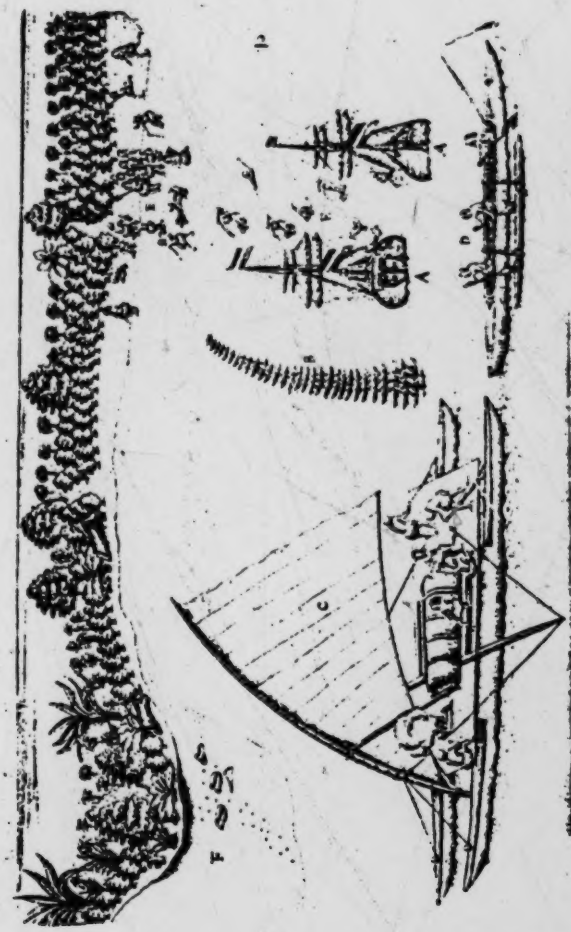

PICTURE 190.—Tongan *longitabi* seen off Tongatabu in 1643, masthead crutch-shaped, two steering paddles in action; right, bonito fishing canoe (*to'o'anga*), fishing rod correctly shown behind aimed paddler (after Tasman, 1643).

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501 175 An equipment not described, but clearly seen in Schouten's and Tasman's figures, is the great balance spar laid athwart the hulls immediately abaft the mast to project outboard on each side. In both these figures the short mast is stepped well forward on the platform and has a crutch-shaped masthead in which the yard rests.

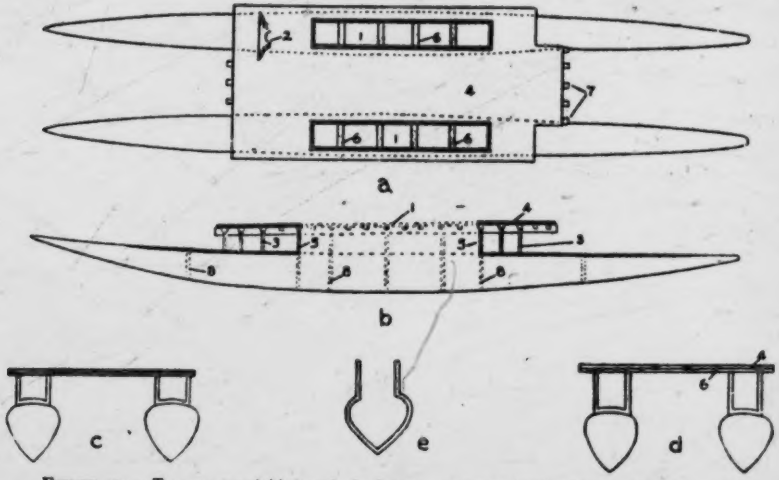

FIGURE 191.—Tongan *tongiaki*, length 69 feet: *a*, plan; *b*, longitudinal section through one hull, vertical dotted lines indicate position of inserted ribs; *c*, cross section through fore end of vessel under fore part of platform; *d*, corresponding section at after end of platform; *e*, cross section of one hull amidships; 1, hatchways; 2, mast shoe; 3, supporting pillars; 4, deck; 5, breakwater to keep water from midships part of hulls; 6, crossbeams supporting deck; 7, fore-and-aft beams under deck (after Cook, 1777).

Cook's description and scaled figures (fig. 191) and the illustrations given by Schouten and Tasman give a clear conception of the build and rig of the *tongiaki*. The two hulls (Cook, 1777, vol. 1, p. 216) were equal in size, "each about 60 or 70 feet long, and from 4 to 5 broad in the middle", the heads pointed and with a slight sheer, the sterns low and bluntly pointed. The bottom of each was sharp along the keel line and the hull in transverse section was distinctly cordate, with sides raised on the edges of the bottom section after the fashion of the *va'a alo* of Samoa and of its local counterpart, the *tafa'anga*, the planks sewn neatly to one another on the inside with stitches passing through a stout beading margining the edges of opposed planks (fig. 188, *b*, 2). The two ends of the open hull thus built were decked over for a considerable distance; the long median section had its sides raised by means of a deep washstrake sewn to the upper edge of the side planking, each end closed in by a transverse board or breakwater.

Two such hulls were connected, 6 to 7 feet asunder, by a number of stout cross beams lashed securely to the upper edges of the four washstrakes. Over these beams (Cook, 1777) and "others supported by stanchions fixed on the bodies of the canoes" was laid a boarded platform of rectangular form. The two extremities projected well beyond the ends of the raised middle section, particularly at the after end, where its longer median part reached nearly to a level with the two

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sterns. In Cook's figure the outermost planks on each side are cut off short near the stern, thus forming an angular rest for the great steering paddle (fig. 191). In Tasman's sketch, a steering paddle is seen in operation on the leeward side of each hull at the after end of this platform. 175 501

Above the central section of each hull a long hatch was left open in the platform, wherein one of the crew was kept constantly bailing out the water that entered by the seams. Between these two hatchways a low arched hut thatched with palm leaves was placed for the use of the passengers and "to screen the crew from the sun and weather". A movable fireplace (*talafu*), shown in both Schouten's and Tasman's figures, was always carried—a square, shallow wooden trough filled with stones [and earth] (Cook, 1777, vol. 1, p. 217). [372]

The rig is thus described by Cook (1777, vol. 2, p. 18):

> Some [of their sailing vessels], and those of the largest size, are rigged so as to tack about. These have a short but pretty stout mast, which steps on a kind of roller that is fixed to the deck near the fore part. It is made to lean or incline very much forward; the head is forked: on the two points of which the yard rests, as on two pivots, by means of two strong cleats of wood secured to each side of the yard, at about one third its length from the tack or heel, which, when under sail, is confined down between the two canoes by means of two strong ropes, one to and passing through a hole at the head of each canoe; for it must be observed that all the sailing vessels of this sort are double. The tack thus fixed, it is plain that, in changing tacks, the vessels must put about; the sail and the boom on the one tack will be clear of the mast, and on the other it will lie against it, just as a whole mizzen. However, I am not sure if they do not sometimes unlace that part of the sail from the yard which is between the tack and the masthead, and so shift both sail and boom leeward of the mast. The drawings which Mr. Hodges made of these vessels seem to favor this supposition. . . . The outriggers and ropes used for shrouds, etc., are all stout and strong. Indeed, the sail, yard, and boom are all together of such an enormous weight that strength is required. 175 501 502

Cook here makes but bare mention of the long stout spar athwart the deck platform abreast of the mast, which projected outboard on either side to a considerable distance. Cook calls it "the outriggers"; properly it is an outrigged spar or balance spar. Its use was primarily to afford attachment to sundry shrouds and guys. Probably it also subserved the purpose of a spar whereon in heavy weather some hands might be stationed on the weather side as live ballast. Williams (1870, p. 64) describes the two ends as "projecting like monster horns".

Exactly how the rigging was arranged is difficult to determine, for the figures by Schouten, Tasman, and Cook disagree. In that of Schouten a guy, or it may be a spilling line, runs from the outer end of the balance spar on the weather side to a point on the yard well above the masthead; in Tasman's large figure it is attached half-way between the masthead and the tack. A short stay or guy is also shown running from each foredeck to the same point on the yard where is made fast the balance spar guy; these are the two ropes mentioned by Cook as confining the tack of the sail between the two hulls. In another of Tasman's figures, where some canoes lie at anchor, a shroud runs from the masthead on each side to an end of the balance spar; a backstay from the masthead is also present.

Two of the principal figures in a plate by Hodges, to which Cook refers, though agreeing in many details with Cook's description, do not agree in all (fig. 192):

> The double canoe in the center of the plate has no balance spar (Cook's "outrigger"); the mast is stepped to one side of the deck cabin; and the heel of the yard, instead of being confined between the heads of the two hulls, is stepped at the head of the port hull as in the *kalia*; features pertaining to the type of the *kalia* are combined with others belonging to the *tongiaki*, so producing a hybrid design. The double canoe on the right in the same plate, although only partly seen, is more typical of the *tongiaki* design as described by Cook; it

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FIGURE 192.—Tongan double canoes; two keem to combine features of the *kalia* with others peculiar to the *tongiaki*; step cleats on after side of mast in canoe at right; in foreground a paddling canoe with stanchion connectives (from Cook, 1777, vol. a).

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shows the deck hut some distance aft of the mast, and the peculiar shoe in which the mast is stepped; a balance spar is present, abreast the mast but projecting only on the port side of the port hull, and a series of small step cleats are shown on the after side of the mast, as well as two broad cleats on opposite sides of the yard at the point where it rests on the forked mast-head—features not present in the central figure. A third double canoe on the left in the drawing, though the hulls and platform are those of the *tongiaki*, has the mast stepped amidships, with deck fittings typical of the *kalia*.

Discrepancies are also seen in the drawing of a double canoe in an aquatint by Webber, who accompanied Cook on his third voyage (fig. 193):

FIGURE 193.—Tongan canoes seen on Cook's third voyage: center, a *tongiaki* having *kalia* features; left, four-boomed sailing outrigger with mast up and sail partly furled against it; balance spar on off-side (aquatint by Webber, published in 1791).

This vessel must be classed as a *tongiaki*, for the hulls are of equal dimensions and are similar in form, with a median row of knobs on each end decking as in the *tafa'anga*. The platform is not raised on a deep median washstrake as in the *kalia*, and there are no spars connecting the head and stern of one hull with the two lee corners of the platform. Conversely, the sail is slung by halyards from the masthead instead of resting in a fork or crutch and appears to be stepped amidships. No balance spar is shown, and the deck hut appears to have a platform over its roof, all characteristics of the *kalia* design.

It is most unlikely that Hodges and Webber should both by mistake mix up in their drawings the characteristics of the two types. The reasonable explanation [177] of the departures from the *tongiaki* design shown in their figures is that the *kalia* design—a copy of the Fijian *ndrua*—which at the time of Cook's visits was in course of introduction into Tonga, had been adopted in part only by some of the Tongan chiefs; the inference is natural that, at the beginning of the transition phase, certain of the old *tongiaki* hulls were equipped with the rig and deck fittings of the *kalia*. Only by such hypothesis can the discrepancies noted be explained satisfactorily. A parallel is found in Rotuma.

The *tongiaki* required a steering paddle in each hull: Collocott and Havea (1922, p. 91) state that three were sometimes required for these vessels. They remark also that in fine weather one man apiece sufficed but that when it was stormy more were needed.

The principal features wherein the *tongiaki* differed from the *kalia* were: 1, in the approximate equality of the two hulls; 2, in sailing, the same ends were always

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175 501 directed forward and in consequence the manipulation of the sail was entirely different; 3, the mast was much shorter and had a forked head in which the yard rested, with the tack of the sail confined by ropes between the prows and not stepped at the fore end of one hull; 4, the presence of an outrigger balance spar; 5, the deck platform was relatively larger and extended considerably farther aft than in the *kalia*; 6, the deck shelter was a tunnel-shaped hut without a platform above the roof.

501 [538] It is common tradition in Tonga today that the *tongiaki* was a notoriously difficult and dangerous craft to handle in bad weather and one not able to beat to windward. It was essentially a fair-weather vessel, a fact pithily expressed in the Tongan proverb, "Takanga a tongiaki", literally, a "*tongiaki's* company", said of a fair-weather friend. Collocott and Havea (1922, p. 91) says: "A couple of these canoes might sail along in company in fair weather, but if a storm sprang up neither could rely much on the other for assistance".

501 502 [189] The clumsiness and lack of weatherly qualities of the *tongiaki* contributed very largely, if indeed not mainly, to the involuntary colonization by Polynesians of several islands well within the Melanesian area. As Thomson (1908, p. 295) remarks, the rig of the vessel enabled it

> . . . to lie close to the wind on one tack, but on the other the sail was broken up into pockets by the mast, which held the wind and stopped all headway. Consequently it was the practice to wait for a fair wind, and set the sail on what would be the lee of the mast, and if the wind changed there was nothing for it but to change the course. It was, no doubt, this fact that led to so many Tongans' being cast away on remote islands, and to the mixing of Polynesian with Melanesian blood.

[184]

501 505 According to the Prince Consort William Tungi, the huge stones of the Haamonga trilithon were quarried at Uvea (Wallis Island) and transported to Tongatabu on an exceptionally large *tongiaki* built on Uvea for the purpose. Collocott and Havea (1922, p. 55) also mention what is probably a variant of the same tradition: a double canoe, the "Lomipeau" (erroneously termed a *kalia*), was used to convey from Uvea many of the stones required in the building of some of the royal supulchral langis on Tongatabu. Another version, recorded by Wilson (1799, p. 284), who was in Tongatabu in 1797, though averring that the langi stones came from Lifuka in the Haapai Islands, confirms the statement of their transport by means of double canoes, according to information which he received from the "Futtafaihe".

[175]

Kalia

175 177 501 [171] [189] Like the *'alia* of Samoa, the Tongan *kalia* is in no essential particular different from the Fijian *ndrua*. In Cook's time, 1773-74, the Tongans had begun to acquire some of these magnificent craft from the Fijians in substitution for their smaller and more primitive form of double canoe, the *tongiaki*. A few years later the process was accelerated and Thomson (1908, p. 295) states that "from 1790 to 1810 it had become the custom of Tongan chiefs to voyage to Fiji in their clumsy *tongiaki*, join in the native wars, and take as their portion of the loot Fijian *ndrua*, in which they beat back to Tonga; and in a very few years the *tongiaki* was extinct".

These *kalia* were also built in the Lau Archipelago of Fiji in later years by Tongan carpenters sent there for this purpose by their chiefs. Whether the design was modified in minor details is uncertain. Models of the Tongan *kalia* do not depart from the Fijian design in any respect, but in the figures given by Paris (1841, pls. 118, 121), the ends of both the hulls are shown pointed and similar,

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the identical form, indeed, that they had in the older type, the *tongiaki*. Whether Paris' figures are correct in this particular is uncertain; in details his figures sometimes show minor inaccuracies, though as already stated there probably was a transitional period when old *tongiaki* hulls were adapted to the new design borrowed from Fiji. A model which I saw being made in Lifuka in 1925 for the Prince Consort by an old Tongan carpenter had the Fijian form of head and stern, and the builder, who was reputedly 93 years of age and the last survivor of the old carpenters' guild, asserted that such was the normal and correct shape.

Another difference to be noted is that Paris figures the heel of yard as stepped in a hole at the extreme end of the hull (fig. 188, *a*, 7), instead of lashed against an angular ridge socket not quite so far forward. As Krämer (1902-3, vol. 2, p. 258) shows the heel of the yard in the Samoan *'alia* to be stepped similarly (fig. 171), the probability is that this particular difference in design did exist in Tonga as well as in Samoa.

The double canoe has long been extinct in Tonga, longer indeed than in Samoa, but occasionally, as in Hawaii and Tahiti, two small dugout hulls are temporarily joined together at some few feet apart by two cross booms lashed athwart the gunwales. One of these is seen in a photograph taken from the "Albatross" in 1899, as she lay in Vavao Harbor (U.S. National Museum negative no. 40181). It is noteworthy that the *bobao* hulls are connected head to stern, as in the double canoes of Manihiki.

TECHNICAL TERMS

According to the old carpenter in Lifuka, many of the principal terms for the various parts were common to Fiji and Tonga, either the same or with the substitution of Tongan words for Fijian when these were descriptive. The more important of these in the two languages are the following (Fijian in parentheses):

Fana (vana): mast.
Fohe (vothe): paddle.
Fohe uli (vothe uli): steering paddle.
Fohe-lahi-matau (?): starboard steering paddle; literally the "large right-side paddle".
Fohe-i-hama (?): left side steering paddle.
Fono (vono): strake or run of planking.
Fono tabu (vono tambu): garboard strake.
Fono bajini vaka (vono laulalo): strake above garboard strake (*bajini*, a necklace made of whale's teeth).
Fono ngutu vaka (vono mbati ni wangga): topmost strake (*mbati*, the mouth, i.e. the open well of the hull).
Hama (thama): the smaller hull.
Hua (sua): scull.
Katea (kata): the larger hull.
Kiato (kaso): cross boom.
La (lathe): sail.
Takele (takele): basal or keel region.
Taumua (taumua levu): fore end or decking.
Taumuli (taumua lailai): after end or decking.
Toko (ndoko): poling stick or quant.
Tomotomo (ndomondomo): topmast.
Tuku (tuku): running fore and back stays of mast, also as a verb, "to slacken" or "to let go".
Vilinga hua (?): sculling hole in platform.

RAFTS

A persistent tradition prevails in Tonga to the effect that in former times rafts were employed in navigation. According to information given by Havea, the name *vakavaka-amei* was applied to this primitive kind of craft. He describes it as a shaped raft with side logs boomed out after the fashion of a double outrigger. He states that his father told him that he had seen a small one made of three logs; the median one was longer than the two lateral ones, which were separated from the median by a space, the whole being kept in position by several poles (*kiato*) laid athwart the three logs and lashed thereto. In larger examples it is said that there was more than one log on each side. Probably if more logs were employed

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the space between the central log and the original two lateral ones would be filled in. The timber used in construction may have been that of the breadfruit tree (*mei*). Havea says that these rafts had some sort of a raised platform on which the crew and passengers sat. They were propelled by paddles, or sometimes by means of a sail. According to some of the old people these rafts were used even for journeys between Tonga and Samoa; they also held that it was by rafts and not by double canoes that the huge sepulchral monoliths required in the building of the royal langis were transported.

The Prince Consort, when discussing this subject with me, confirmed the statement that rafts were formerly in use in Tonga; his grandfather, King George I, had assured him that rafts were the first sea craft used in Tonga. His description, however, was that they were formed out of two great bundles of bamboos, held apart and connected by several cross spars (*kiato*).

Havea's account of this raft, after making due allowance for inaccuracies in detail in a description furnished by a person who had never seen the object he describes, points definitely to the former existence of a Tongan sea craft akin to or possibly identical with the sailing catamaran of Mangarèva figured and described by Beechey (1831, vol. 1, p. 105) and closely related to the large river rafts still in active use in Fiji. The specific statement that it was used to maintain intercourse with Samoa is particularly interesting in view of the old Samoan myth, mentioned elsewhere, which claims that rafts were in use there prior to the introduction of canoes.

The variations found in the several accounts make it clear, however, that tradition cannot be relied upon for details; all that can be reasonably certain is that rafts were in use at an early period in the history of these islands and that they were probably employed in interisland communication.

NIUE

Niue, named "Savage Island" by Cook, owing to the fierce hostility of the natives on the occasion of his landing in 1774, is about 30 miles in circumference. It is relatively populous, for the soil is fertile and flying fishes abound in the sea. Owing to the absence of any lagoon, the fringing reef surrounding it makes it impossible to use canoes of a size larger than can be hauled to land over the reef in rough weather. For what the Niue canoes lack in size, their numbers compensate; on every dark night the torches of little fleets of canoes spangle the sea off the leeward coast with dancing lights.

OUTRIGGER CANOES

Cook (1777) describes the canoes which he saw as

> . . . precisely like those of Amsterdam Island [Tongatabu], with the addition of a little rising on each side of the open part; and [they] had some carving about them, which showed that these people are full as ingenious. Both these islanders and their canoes agree very well with the description M. de Bougainville has given of those he saw off the Isles of Navigators [Samoa], which lie nearly under the same meridian.

The only canoes the islanders now possess are dugout fishing outriggers of small size. The largest, which accommodate four persons (*vaka heke fa*), do not exceed 25 feet in length, with a depth of 18 to 24 inches; the majority, paddled by one man, and with room for not more than two, are much smaller, ranging from 17 to 20 feet long (fig. 104). Formerly six-seated canoes (*vaka heke one*) were built, but these were rare (Loeb, 1926, p. 91).